



Aqua EV-based RVS for bands 1-4

MODIS Characterization Support Team
01/14/2015



Overview



- **MCST delivered the C6 LUT for Aqua MODIS on Nov, 2011**
 - Improvements over C5 included detector-dependent RVS for VIS bands (8-12), time-dependent RVS for ocean bands (13-16), correction for the SD degradation at 936 nm, and EV-based gain for bands 8 and 9
 - EV response trends from 12 representative AOI derived from the pseudo-invariant desert targets Libya 1: +24.42 , +13.35 , Libya 2: +25.05 , +20.48, and Libya 4: +28.55 N, +23.39
 - EV-based gain derived to account for the inadequacies of a linear approximation of RVS on-orbit change between SD and lunar AOI for bands 8 and 9
- **Long-term trends for bands 1-4 were also derived to supplement the SD and lunar measurement-based RVS**
 - No observable deviation ($< \pm 1\%$) seen at the time.
 - Updated results also presented at MODIS Sci. Meeting Cal. Workshop (April, 2014)



Overview



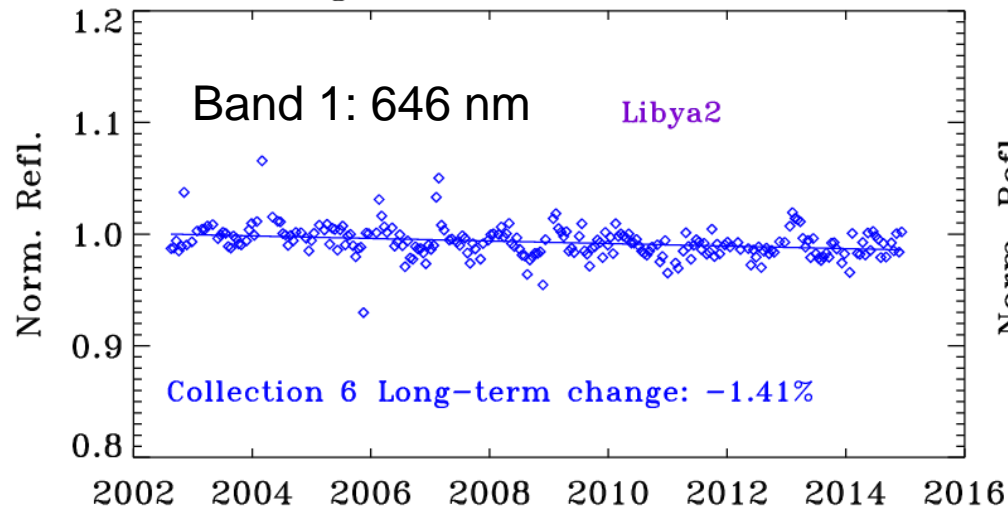
- **Aqua C6 RVS currently uses on-board calibrators (SD & lunar) in addition to EV and SRCA MS ratios for bands 1-4**
 - MCST regularly evaluates the long-term desert/Dome C trends to monitor the calibration stability for these bands
 - Recent trends for bands 1 and 4 (especially) at nadir indicate a need to extend the current approach used for bands 8 and 9 to bands 1-4
 - Normalized TOA reflectance trending at various scan-angles shown in the next slides



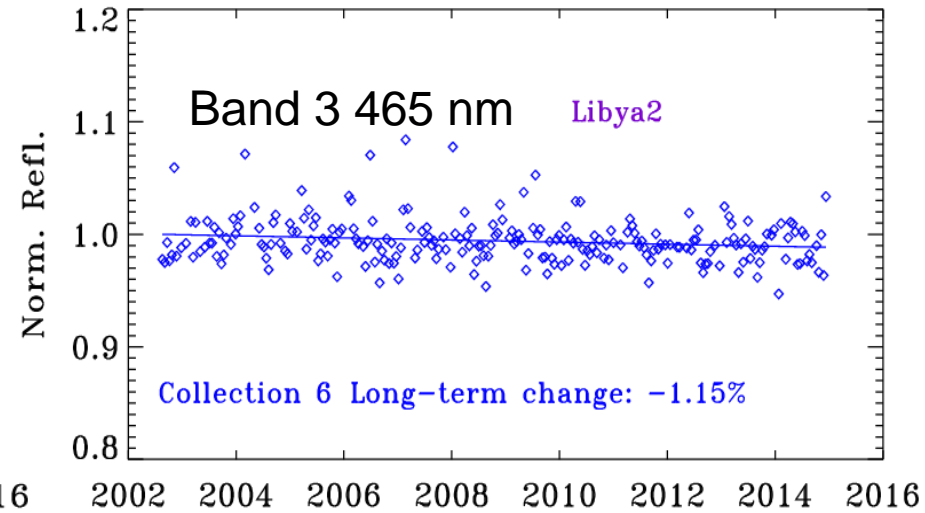
Aqua Bands 1-4 desert TOA Reflectance trending at nadir



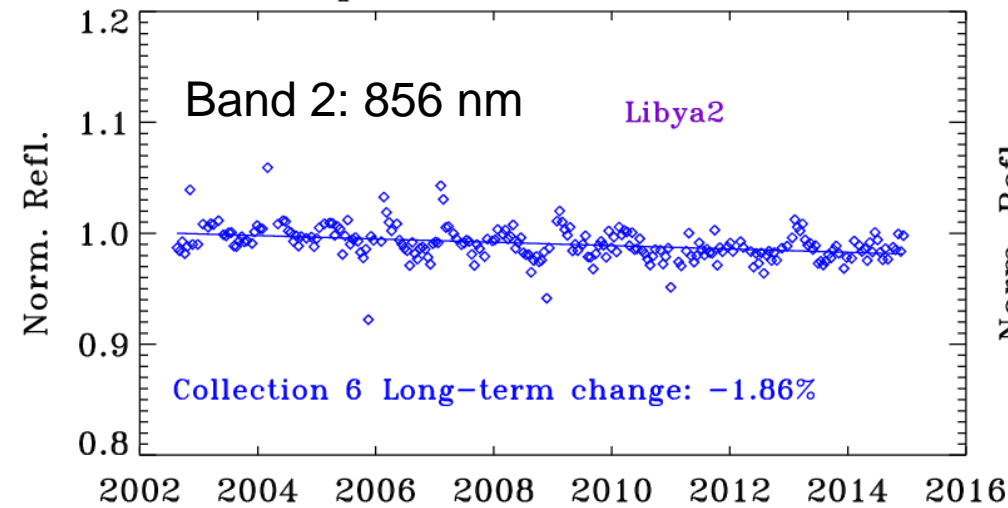
Aqua B 1 MS-1 Fr 649



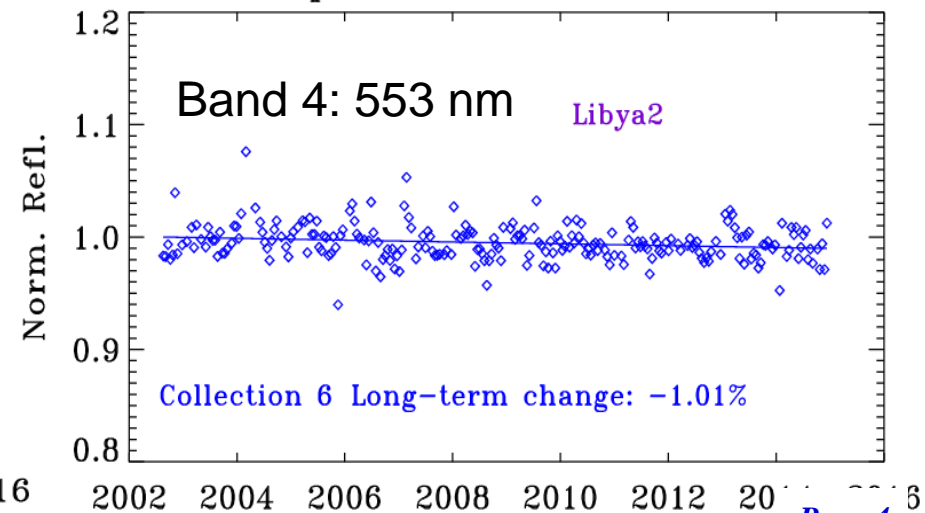
Aqua B 3 MS-1 Fr 649



Aqua B 2 MS-1 Fr 649



Aqua B 4 MS-1 Fr 649

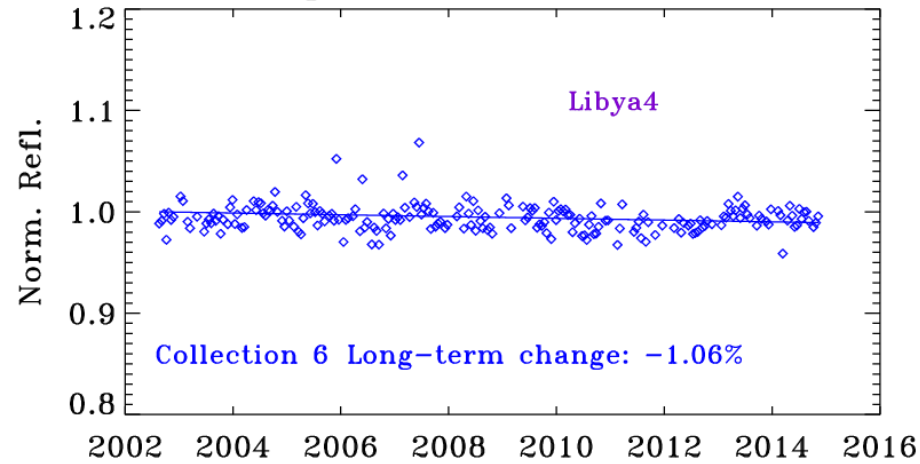




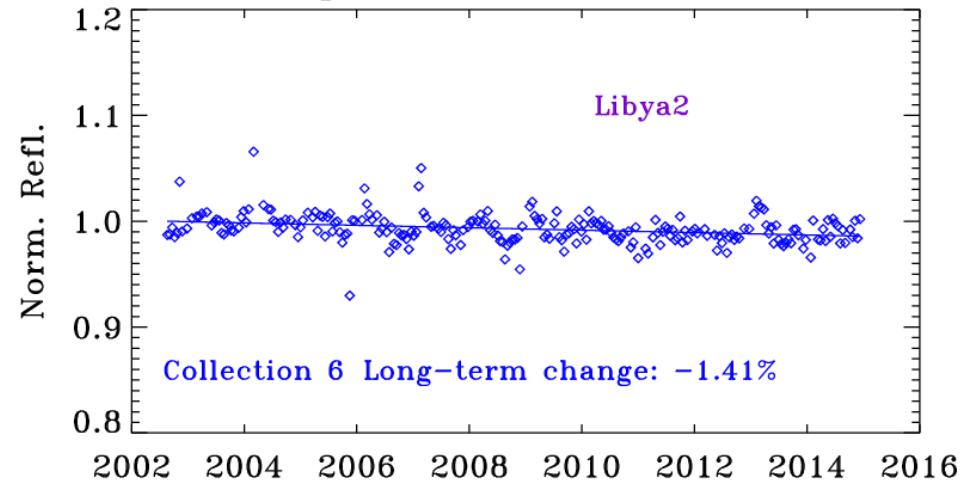
Aqua Bands 1 desert TOA reflectance trending at different AOI



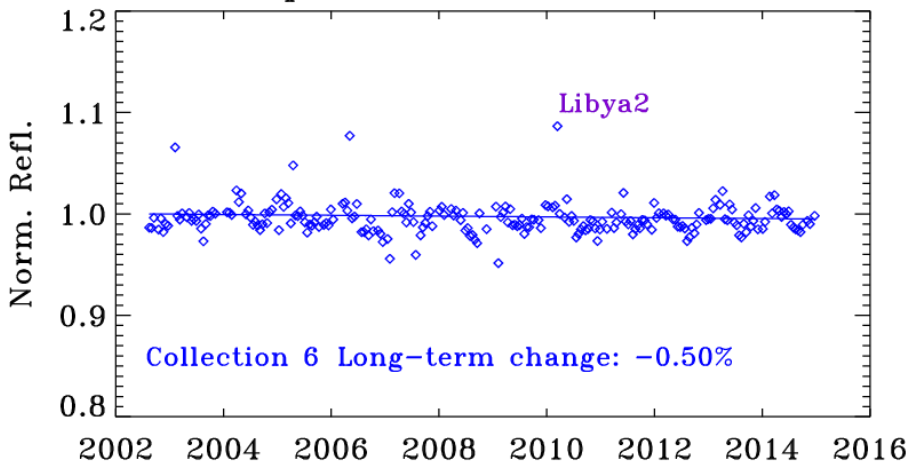
Aqua B 1 MS-1 Fr 326



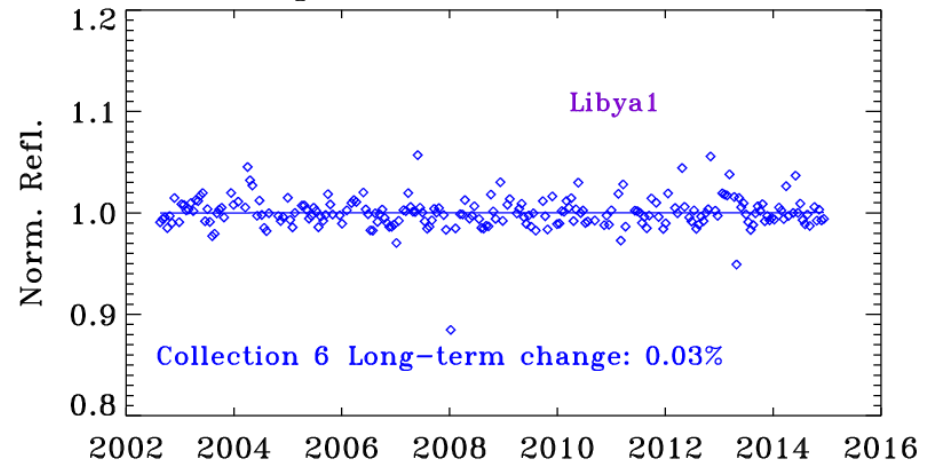
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Aqua B 1 MS-1 Fr 1055

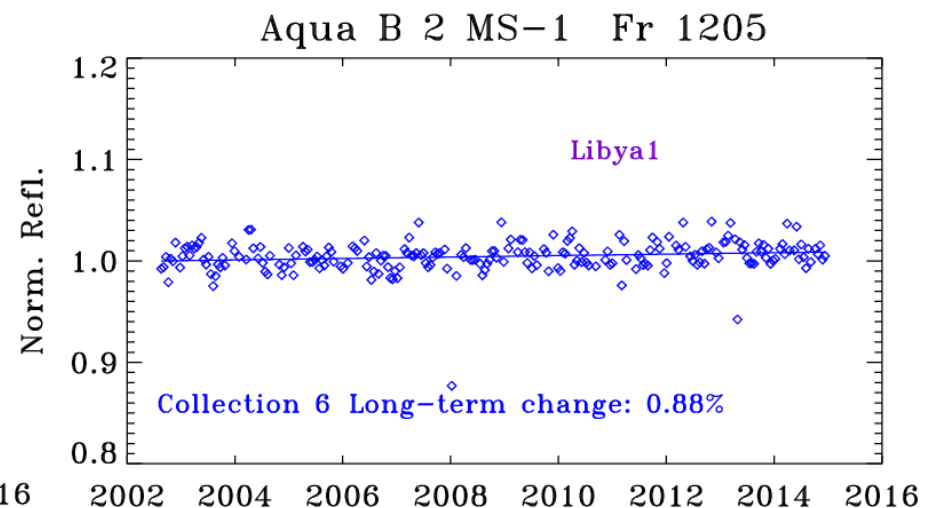
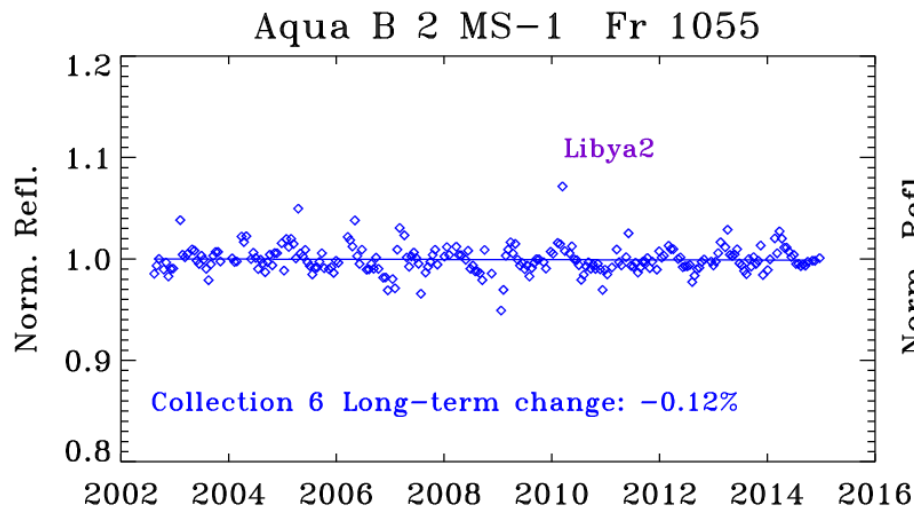
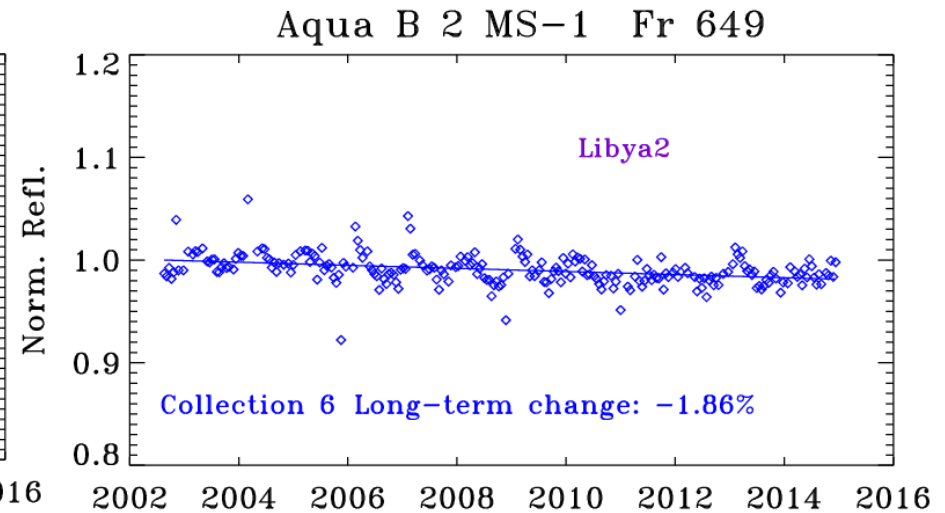
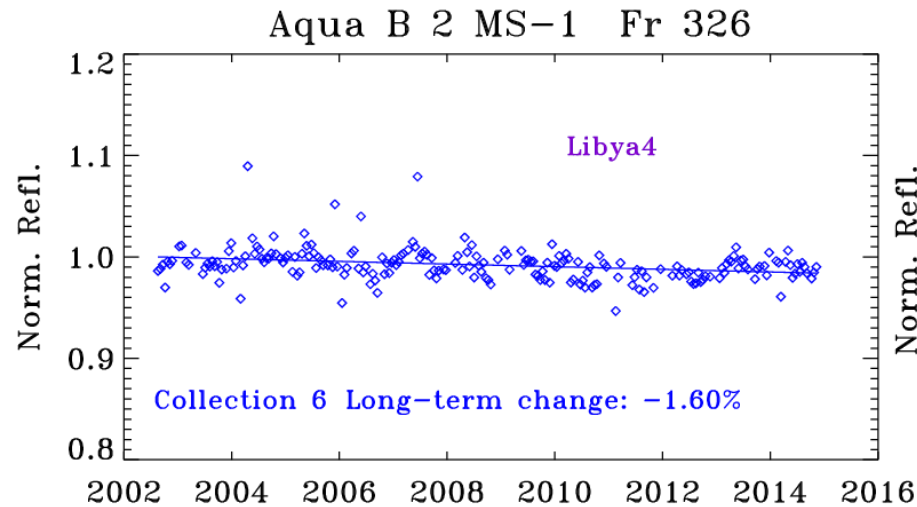


Aqua B 1 MS-1 Fr 1205





Aqua Bands 2 desert TOA reflectance trending at different AOI

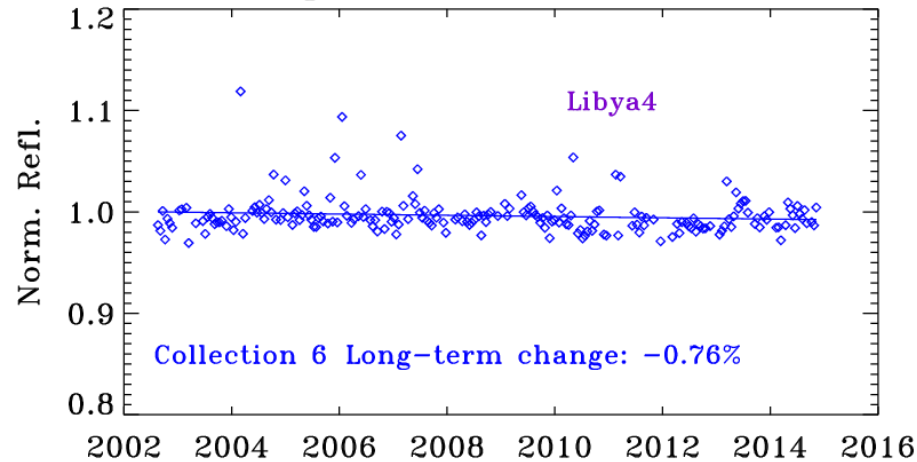




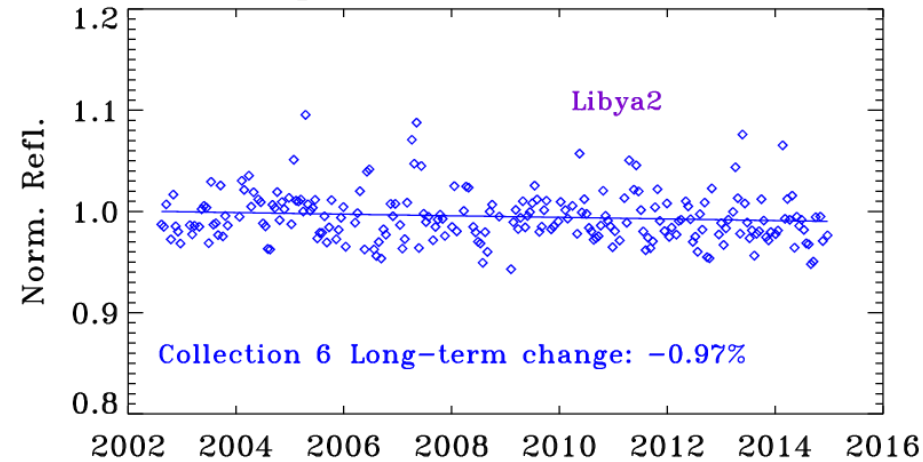
Aqua Bands 3 & 4 desert TOA reflectance trending at different AOI



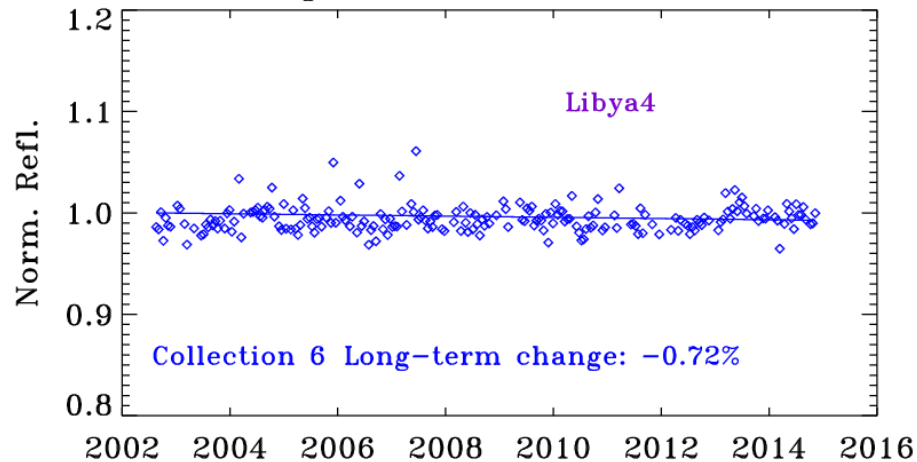
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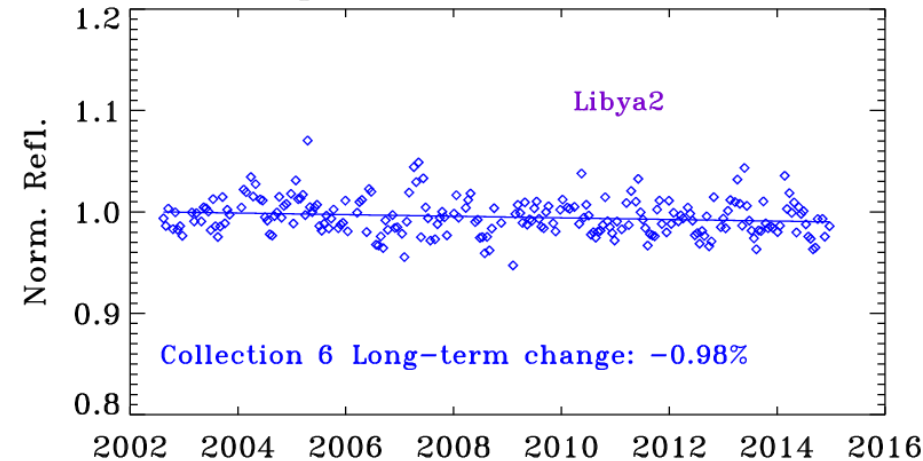
Aqua B 3 MS-1 Fr 1055



Aqua B 4 MS-1 Fr 326



Aqua B 4 MS-1 Fr 1055

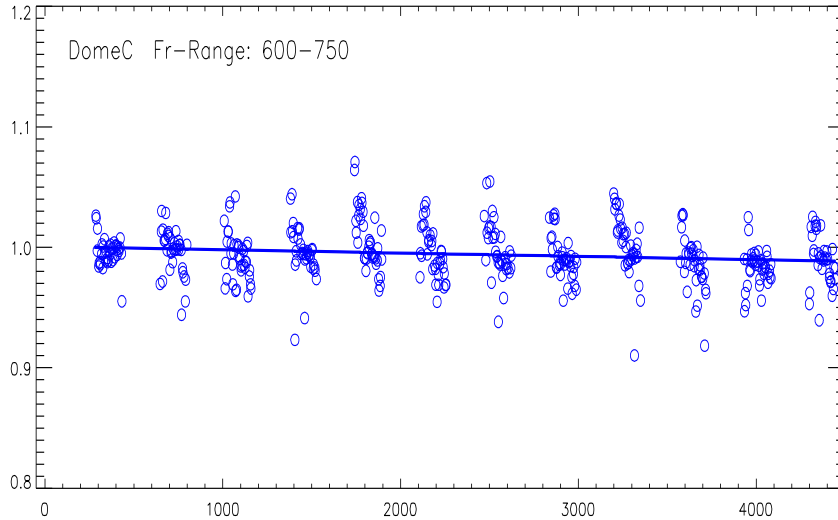




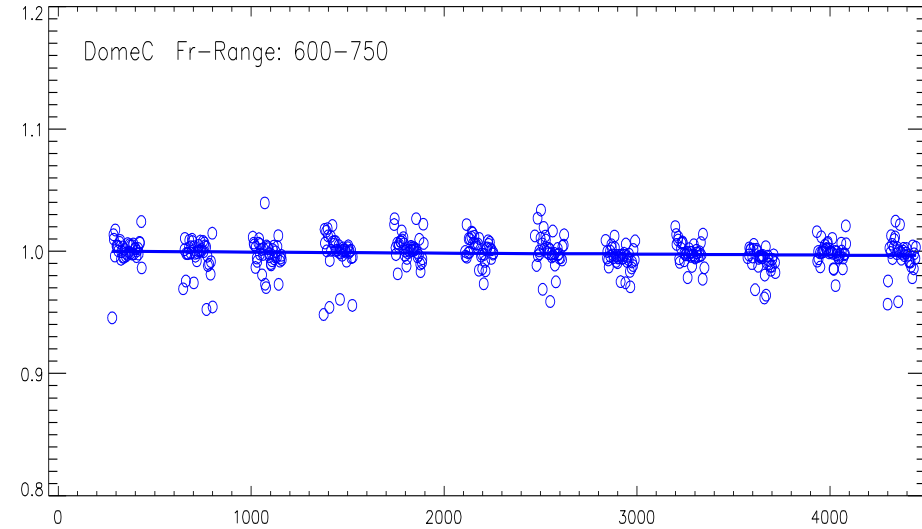
Aqua Bands 1-4 TOA reflectance trending from Dome C near nadir



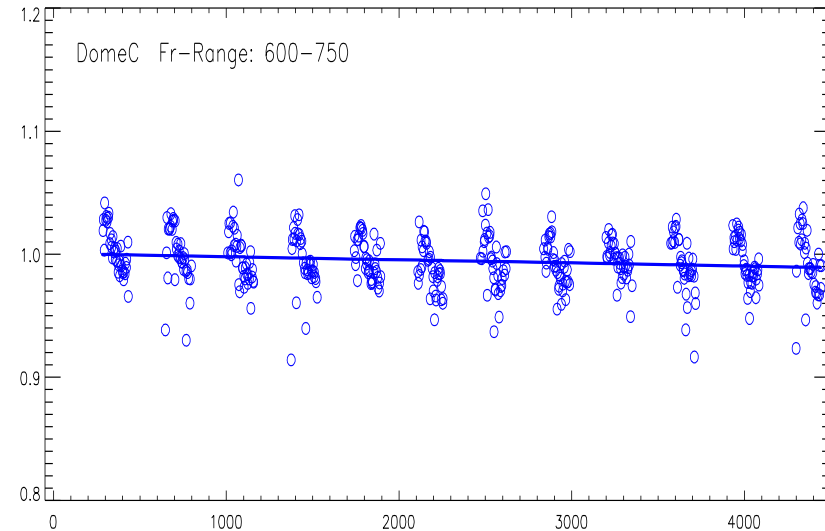
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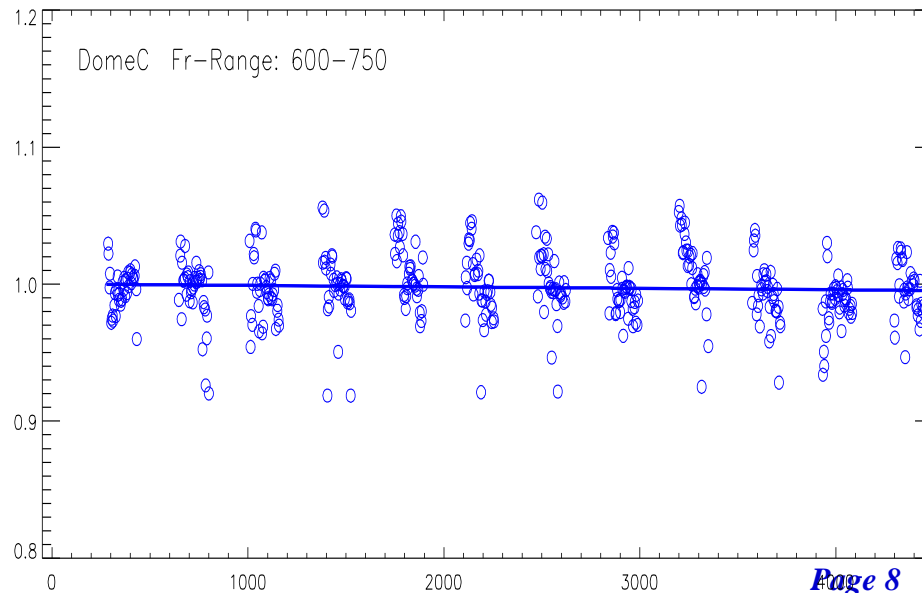
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B2



B4





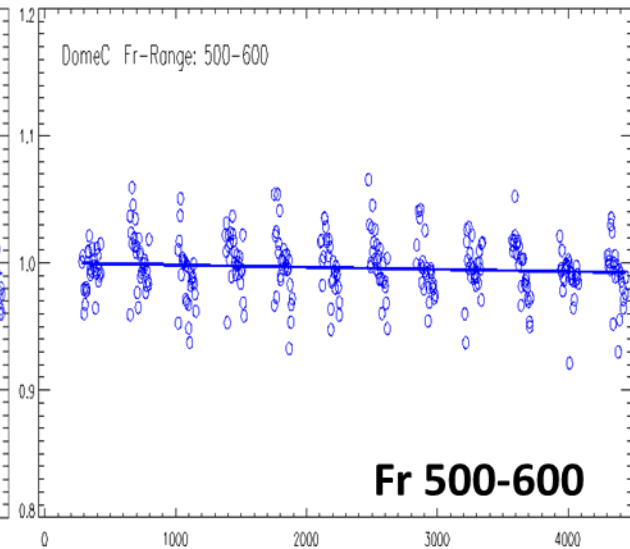
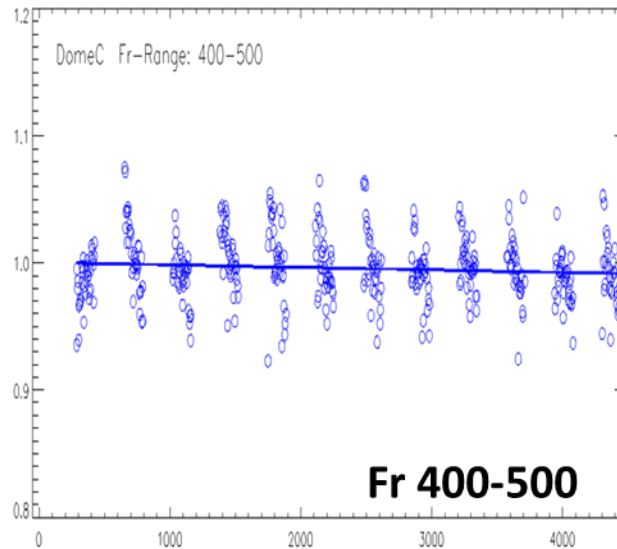
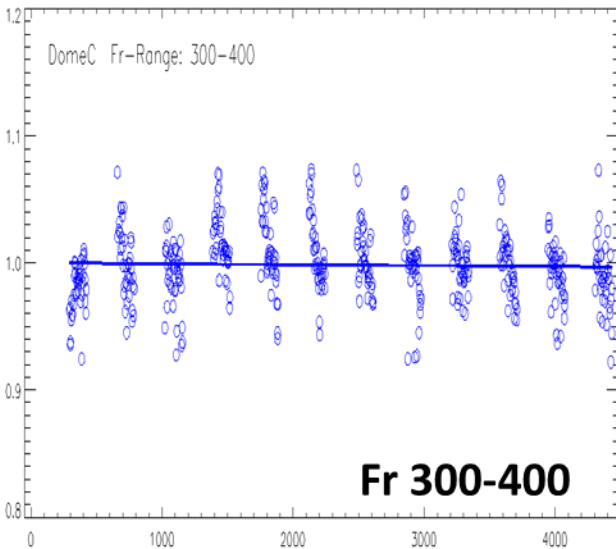
Aqua Band 1 TOA Reflectance Trending from Dome C at different AOI



B1

B1

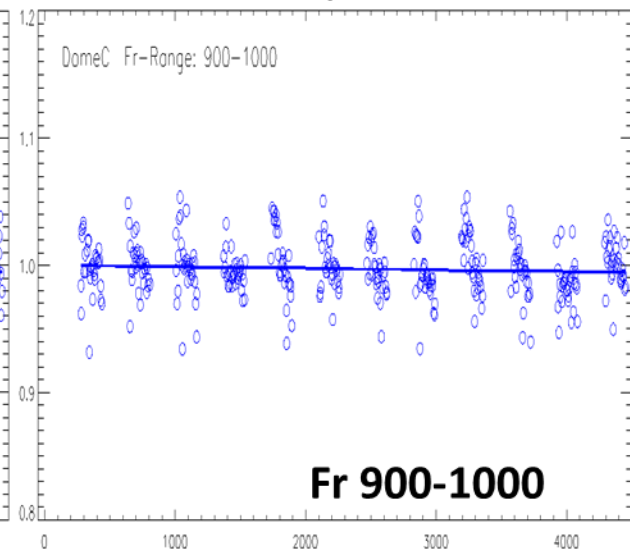
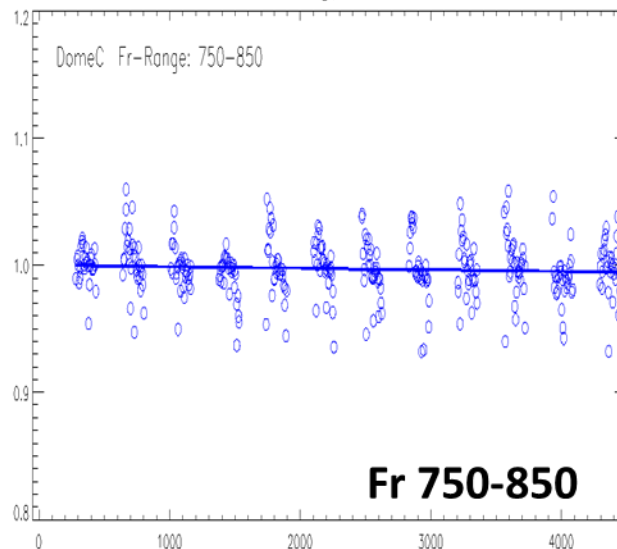
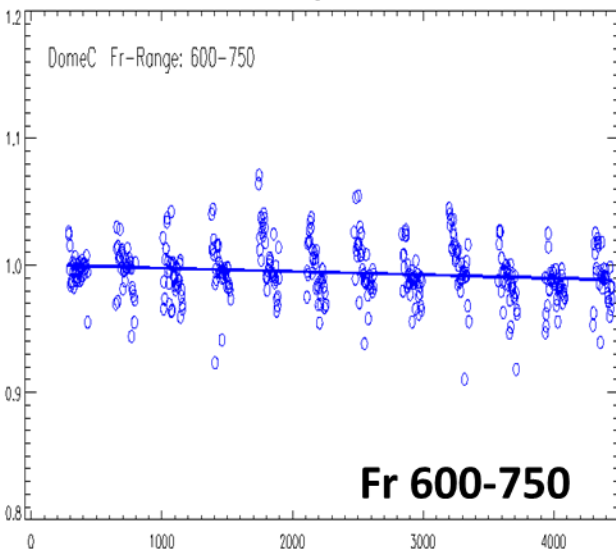
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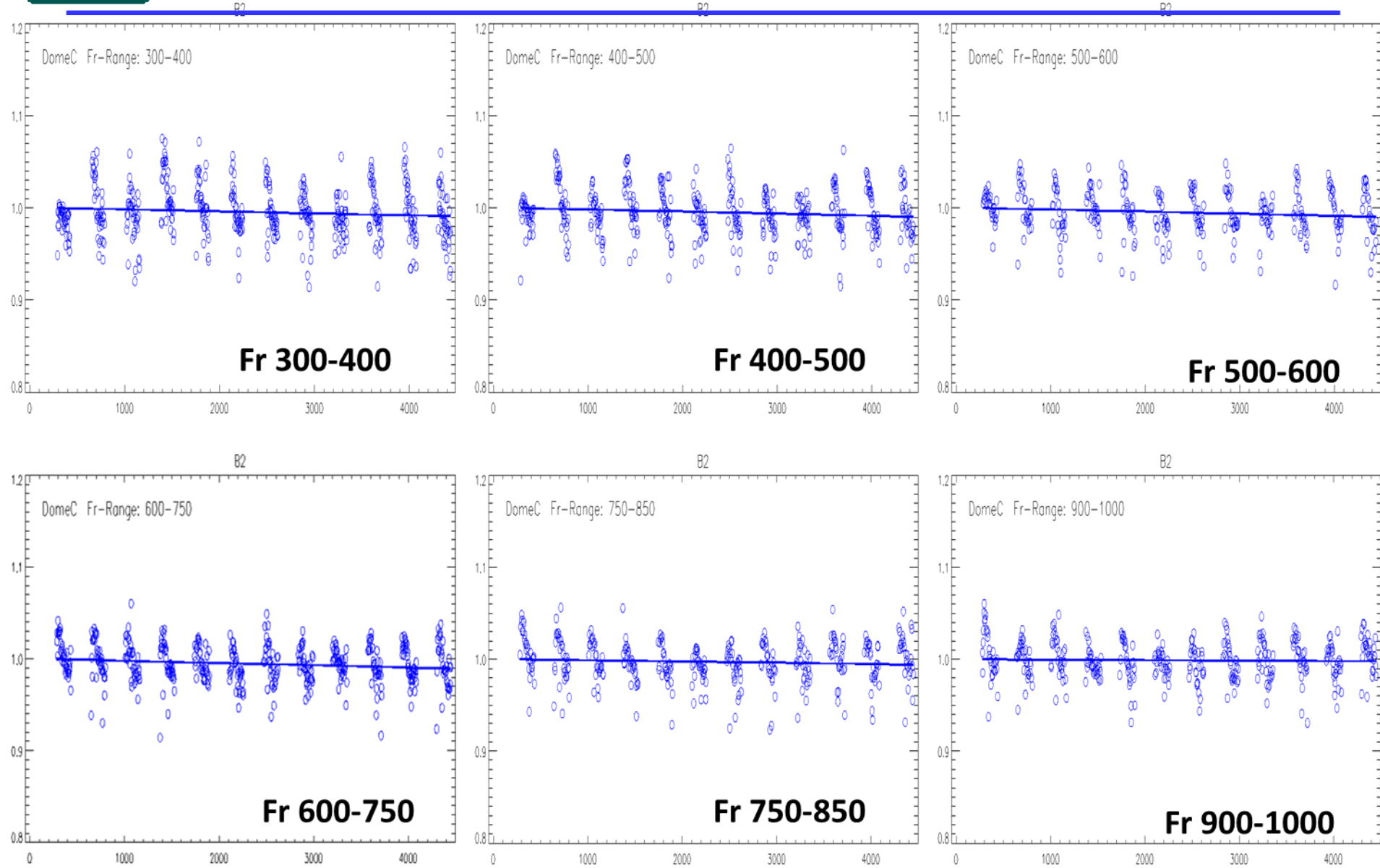
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Aqua Band 2 TOA Reflectance Trending from Dome C at different AOI





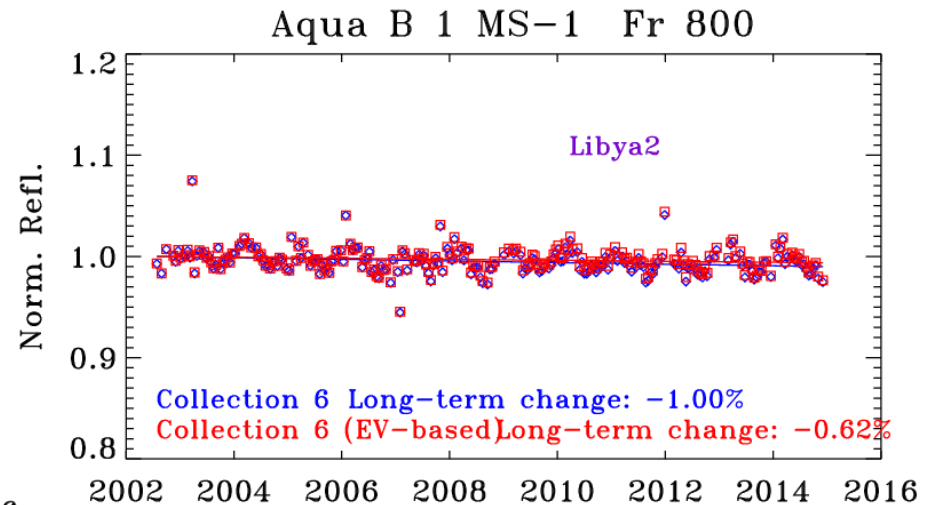
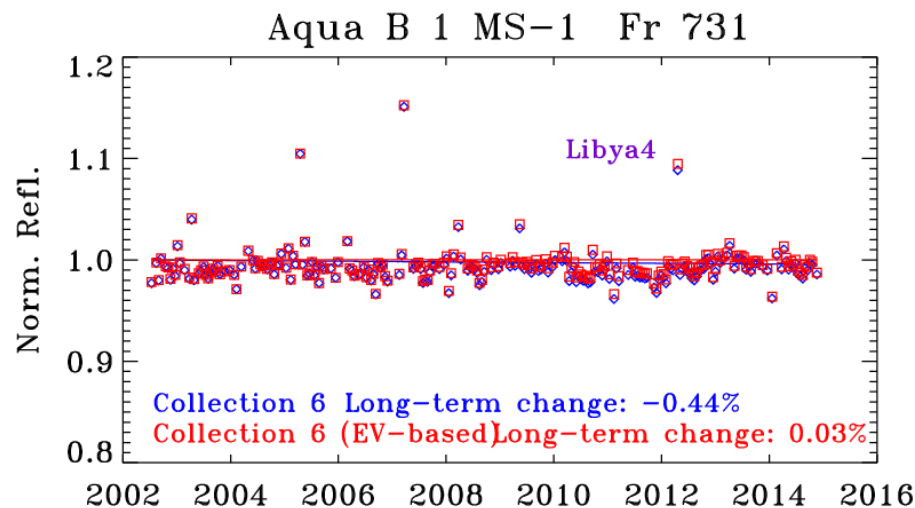
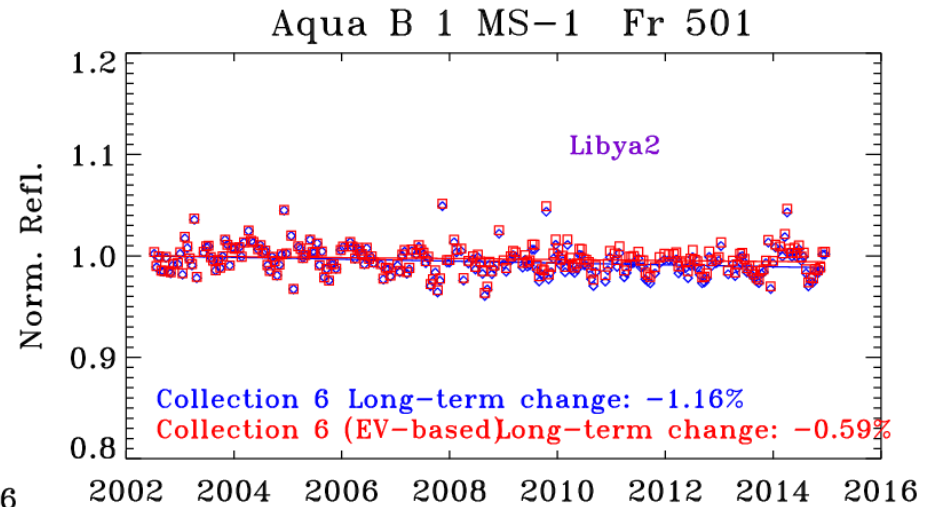
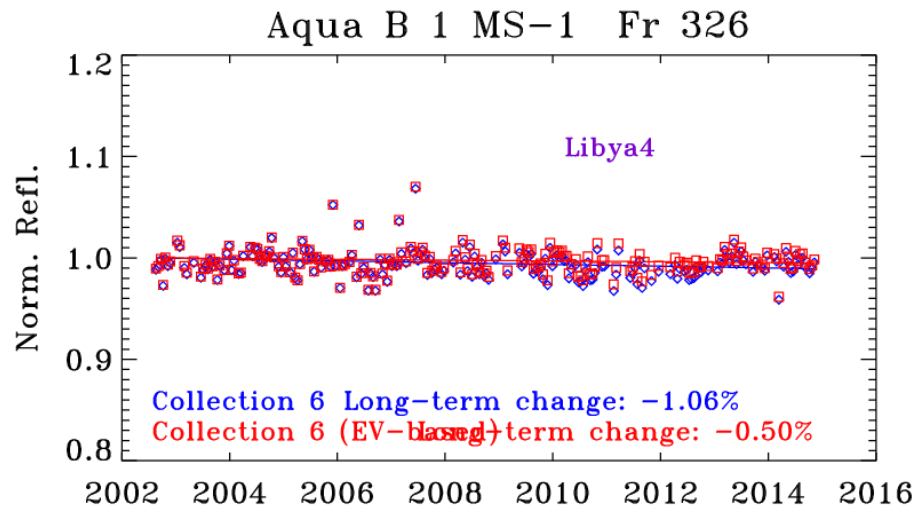
Aqua EV-based RVS for bands 1-4



- A measurable trend $> 1\%$ (but within 2%) is seen near nadir for bands 1-4 from the desert and Dome C trending
- Trends within 1% at the larger AOI, including the SD, therefore indicating that SD calibration is sufficient in accurately characterizing the sensor change at SD AOI
- With the exception of band 2, change at the smaller AOI (frame 326) is generally seen to be around or within 1%
- The EV-based RVS approach, previously applied to bands 8 and 9, is extended to apply to bands 1-4.
 - SD & lunar measurements are supplemented by the EV-trends. Quadratic fit over AOI
 - Results and comparisons included in next slide

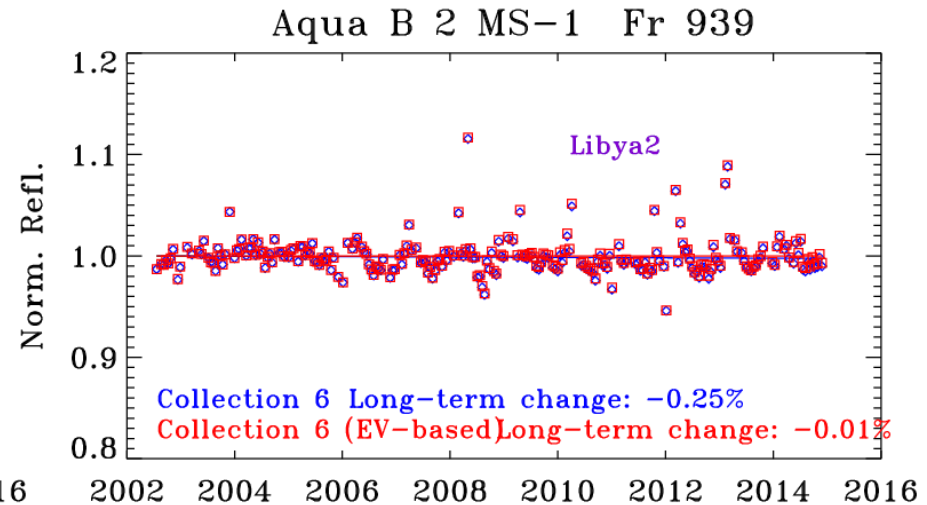
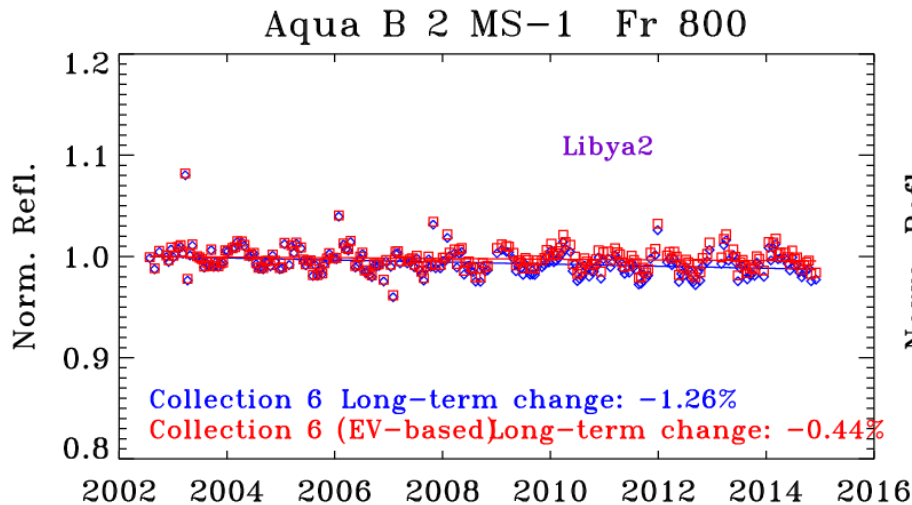
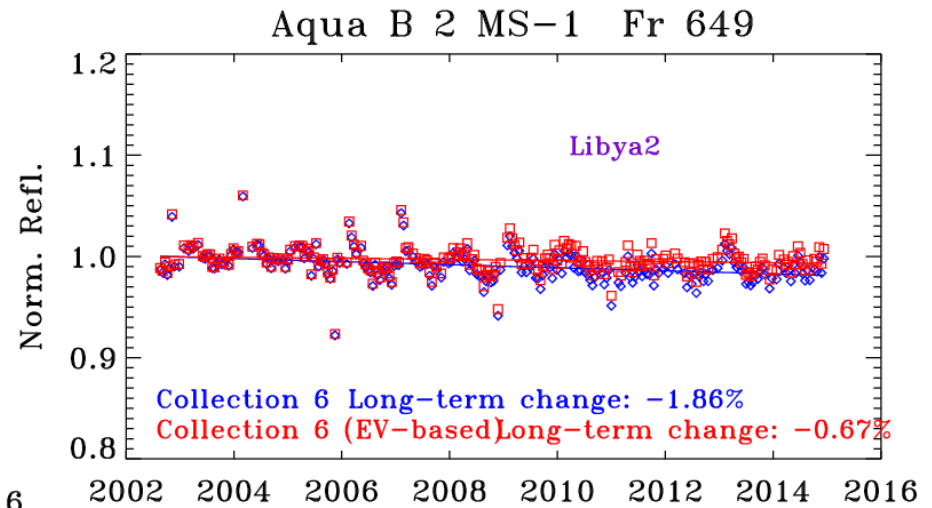
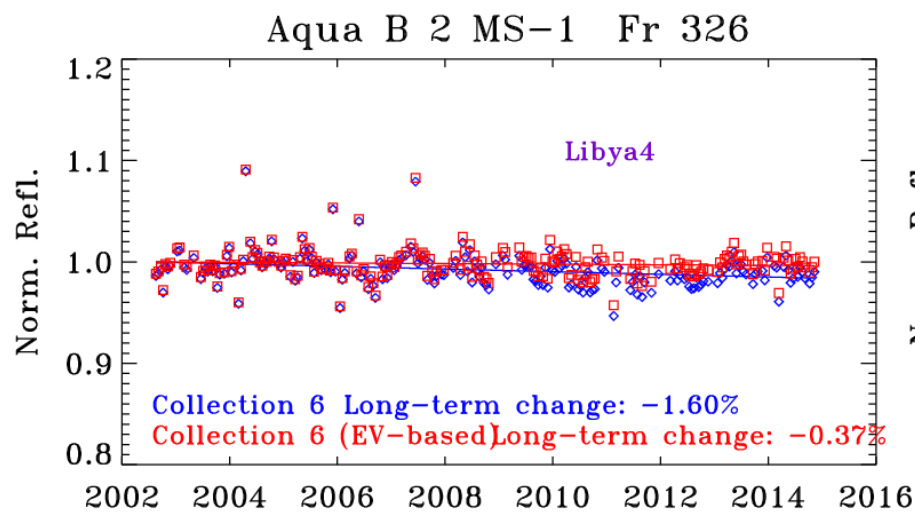


Aqua Bands 1 desert TOA Reflectance trending



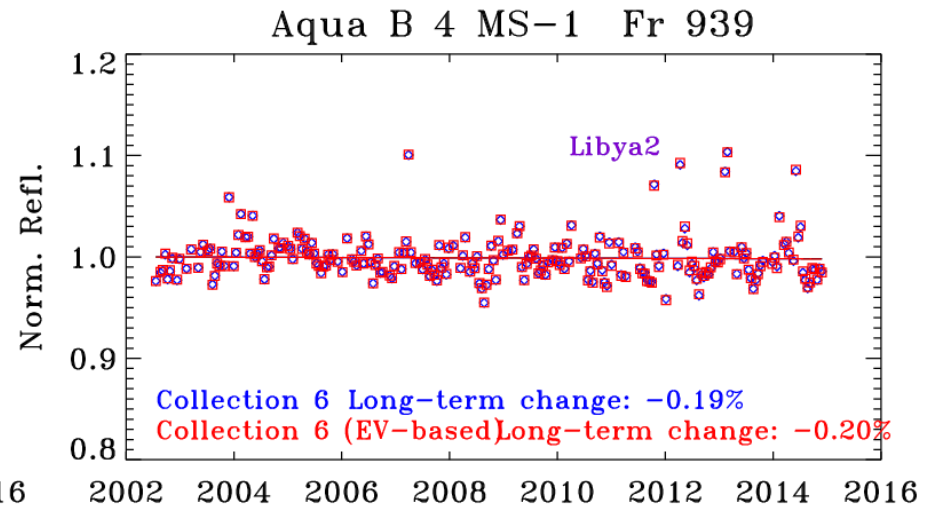
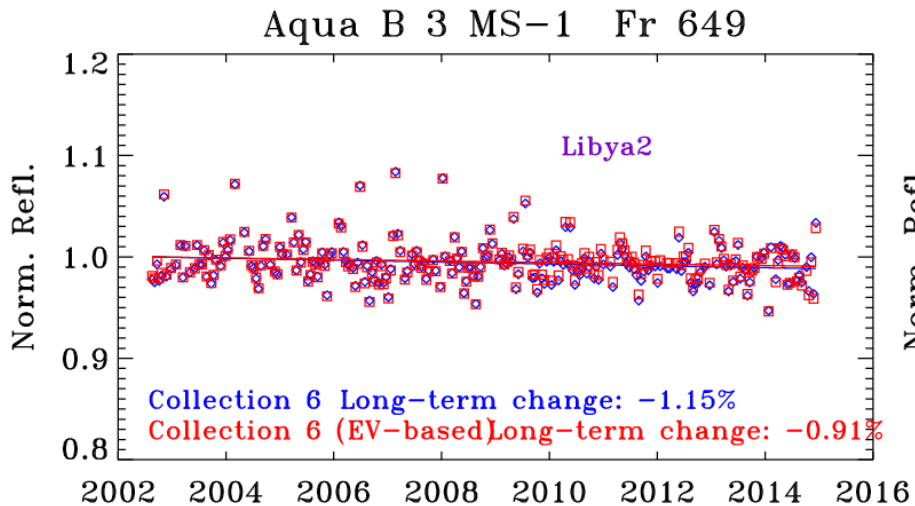
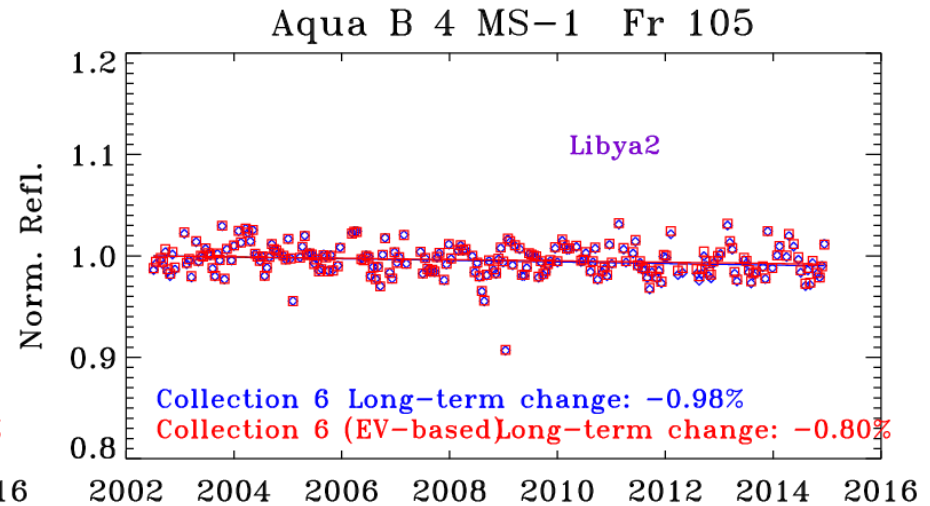
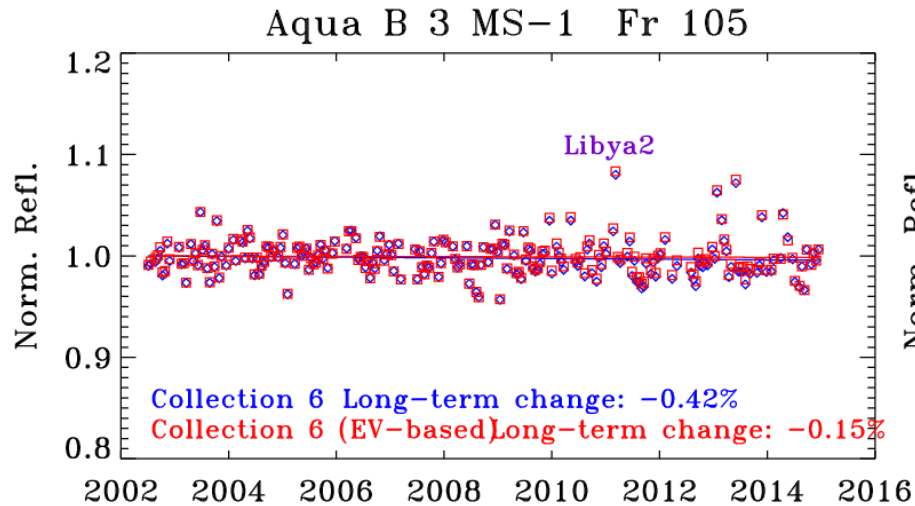


Aqua Bands 2 desert TOA Reflectance trending





Aqua Bands 3 & 4 desert TOA Reflectance trending





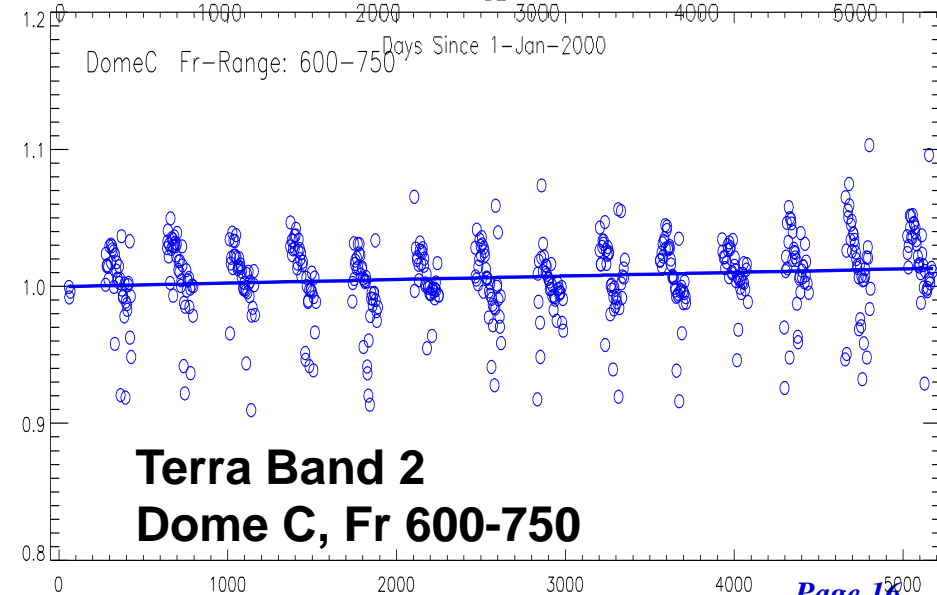
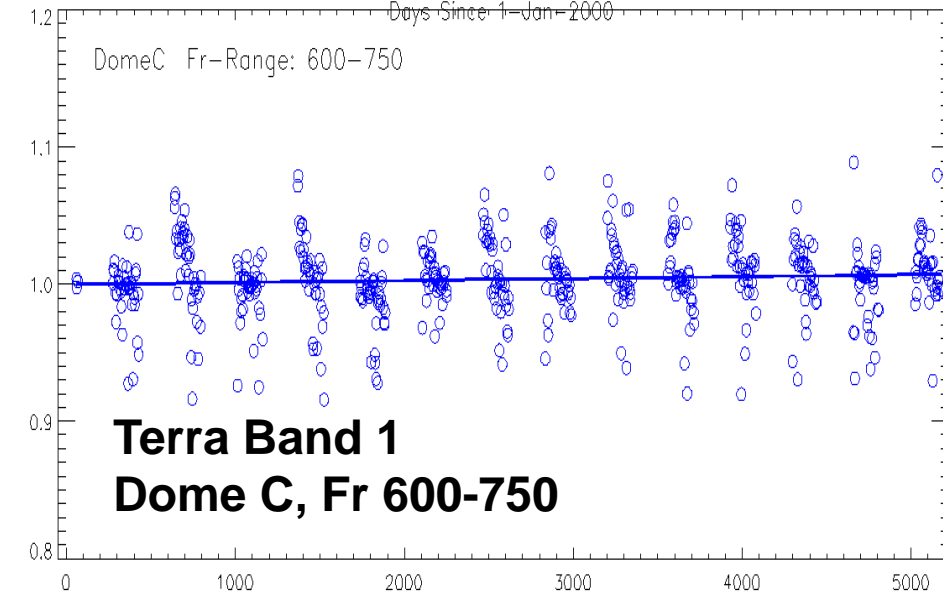
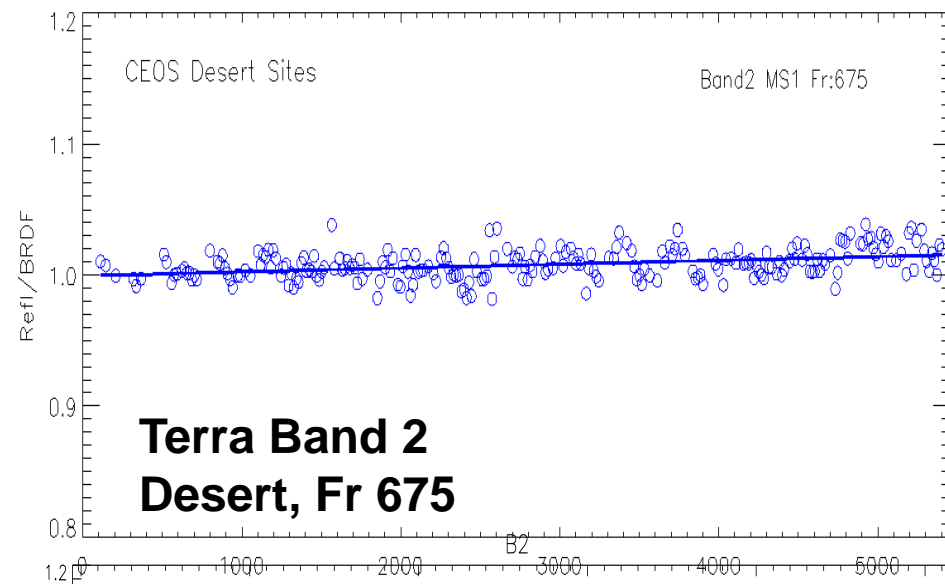
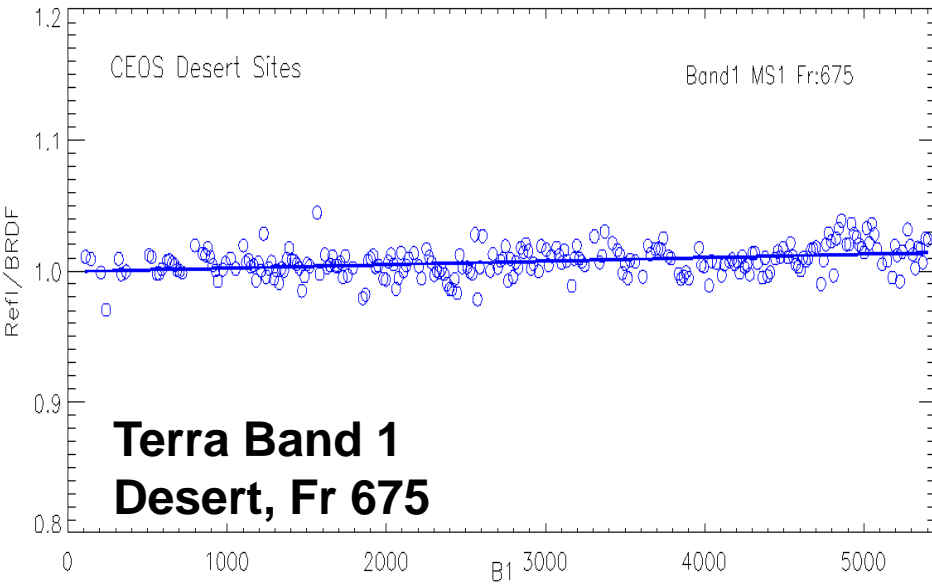
Summary

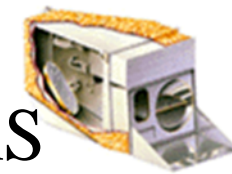


- **MCST proposes implementing this EV-based RVS change in Aqua C6 forward processing for Aqua bands 1-4**
 - Goal is to maintain the accuracy for the forward LUT
 - No reprocess planned/proposed
 - A gradual phase-in is being planned. A similar approach was implemented in 2013 for Terra band 10, where the EV-based RVS algorithm was extended to apply to band 10



Backup: Terra trends in response to Alex Lyapustin request





Backup: Aqua and Terra comparison using VIIRS

